

**Task 2.3.1R**

**Sacramento to Bakersfield  
High-Speed Train Alignments/Stations  
Screening Evaluation  
Summary**

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## S.0 SUMMARY

Following adoption of a *Final Business Plan*<sup>1</sup> in 2000, the California High-Speed Rail Authority (Authority) recommended the state proceed with implementation of a statewide high-speed train system by initiating the formal state and federal environmental review process through the preparation of a state program-level Environmental Impact Report (EIR) and a federal Tier I Environmental Impact Statement (EIS) or Program EIR/EIS. The Authority is the state lead agency for the California Environmental Quality Act (CEQA) and the Federal Railroad Administration (FRA) is the federal lead agency for the National Environmental Policy Act (NEPA). As part of the Program EIR/EIS, a number of project alternatives will be evaluated including a High-Speed Train Alternative. Within the High-Speed Train Alternative, there is a range of high-speed train alignment and station location options to be considered.

The purpose of this High-Speed Train Alignments/Stations Screening Evaluation is to consider all reasonable and practical options within the Sacramento to Bakersfield corridor at a consistent level of analysis and focus the Program EIR/EIS on those alignment and station options that best attain the following objectives established by the Authority.

- Maximize Ridership/Revenue Potential
- Maximize Connectivity and Accessibility
- Minimize Operating and Capital Costs
- Maximize Compatibility with Existing and Planned Development
- Minimize Impacts to Natural Resources
- Minimize Impacts to Social and Economic Resources
- Minimize Impacts to Cultural Resources
- Maximize Avoidance of Areas with Geological and Soils Constraints
- Maximize Avoidance of Areas with Potential Hazardous Materials

This alignment and station screening evaluation was accomplished through the following key activities.

- Confirmation/reconsideration of past alignment and station decisions based on review of previous studies.
- Identification of alignment and station options not previously evaluated through meetings with elected officials and public agencies and through the environmental scoping process.
- Evaluation of alignment and station options using standardized engineering, environmental, and financial criteria and evaluation methodologies.
- Identification of the alignment and station options ability to attain defined objectives.

### S.1 ALIGNMENT AND STATION OPTIONS STUDIED

The Sacramento to Bakersfield corridor was divided into seven segments for analysis purposes. These segments include:

1. Sacramento to Stockton
2. Stockton to Modesto
3. Modesto to Merced
4. Merced to Fresno
5. Fresno to Tulare
6. Tulare to Bakersfield
7. Bakersfield to Los Angeles Connections.

<sup>1</sup> California High-Speed Rail Authority. *Building a High-Speed Train System for California, Final Business Plan*. June 2000.

The alignment and station location options within these segments are summarized below and illustrated in Figures S.1.0 through S.1.7, following the text.

All Central Valley alignments are composed of line segments from four general categories. High-speed rail alignments either follow the two existing rail corridors on adjacent rights-of-way or they follow new alignments in open territory through the Valley. The existing rail corridors are designated as **SP/WP** (old Southern Pacific or Western Pacific, now operated by Union Pacific) and **BNSF** (Burlington Northern and Santa Fe Railway). The new alignments run through new territory either west of State Highway 99 (**W99**) or east of it (**E99**). Numerous combinations of these line segments can be constructed throughout the roughly 270 miles of territory between Sacramento and Bakersfield. **Connectors** to allow combinations of the elements of each of these four general categories within and among the seven segments are designed to provide either high-speed non-stop through routes among the four categories or lower speed stopping tracks to stations that cannot be located on high-speed through routes because of physical, operating or environmental constraints in the urban station areas.

The combinations of station sites and alignments yield a set of 147 alignments in the geographical segments below.

### S.1.1 Segment 1: Sacramento to Stockton

Five station sites have been considered in Sacramento. These are arrayed along three of the primary alignment groups between Sacramento and Stockton, namely the WP and SP as existing freight corridors and the Central California Traction (CCT) corridor.

The S11 Sacramento Downtown station site is served by two possible alignment groups to the south through the segment, which it shares with the other station sites that do not fully reach downtown.

The western approach to the downtown station is under 3<sup>rd</sup> Street to a point south of US 50 Freeway, then via SP River line and WP mainline to a point north of Stockton. This route is shared in part by station sites at S12 Curtis Park, S13 Sacramento Executive Airport and S15 Freeport West.

The eastern approach to downtown station is via alignment adjacent to SP Fresno line toward the east and south. After Power Inn Road station site, possible alignments south to Stockton follow the SP main line, with a bypass track around Lodi, or follow the Central California Traction right-of-way.

All high-speed alignments converge on a single high-speed alignment near northeastern Stockton. Other lower-speed alignments are able to reach station sites in Stockton.

The three primary alignment groups available from Sacramento to Stockton (WP, SP and CCT) produce 24 variations when considered as station-to-station routes between the two cities.

### S.1.2 Segment 2: Stockton to Modesto

Three station sites have been considered in Stockton. Each is served by a lower-speed station track alignment that diverges from the high-speed alignment north and west of the city. It may also be possible to serve one of them on a constrained high-speed alignment.

S21 Farmington Road east of the SR 99 Freeway is the site of a possible joint-use station with Amtrak and may be served on a high-speed alignment. S22 is a downtown site at the existing ACE Commuter Rail station. S23 is a new site at the Stockton Metropolitan Airport.

Alignments south of Stockton follow the BNSF mainline toward eastern Modesto or a new West of 99 alignment toward western Modesto. The BNSF route is adjacent to the existing freight and Amtrak route.



The West of 99 (W99) alignment crosses the SR 99 Freeway and establishes a new route several miles west of the freeway.

The two primary alignment groups available from Stockton to Modesto (BNSF and W99) produce 11 variations when considered as station-to-station routes between the two cities.

### **S.1.3 Segment 3: Modesto to Merced**

Five station sites have been considered in Modesto. Three are reached from the north from BNSF alignments. S31 Modesto Amtrak Briggsmore, S32 Modesto Empire remain on the BNSF route, while S35 Modesto East can be served on a new East of 99 (E99) high-speed alignment. High-speed alignments along the BNSF or E99 route continue toward Merced from these stations.

Two stations reach the western side of the area. S33 Modesto SP Downtown is on a stopping track alignment along the existing SP route, while S34 Modesto West is on a new high-speed W99 alignment farther from the metropolitan area. High-speed alignments along the SP or W99 route continue toward Merced from these stations.

The four primary alignment groups available from Modesto to Merced (W99, SP, BNSF and E99) produce 27 variations when considered as station-to-station routes between the two cities.

### **S.1.4 Segment 4: Merced to Fresno**

Five stations sites have been considered in Merced. Three are reached from the north from either BNSF or E99 alignments. S41 Merced Castle can be connected to all feasible alignments toward Fresno. S42 Merced University lies on a new part of the E99 alignment. This and S45 Merced Plainsboro connect to the combined BNSF/E99 alignment toward the Fresno area.

Two alignments reach the western side of the area from the north. S43 Merced Airport and S44 Merced SP Downtown are reached from the north by either SP or W99 alignments and continue toward Fresno by the same choices. Merced Downtown would not be served by a high-speed alignment.

The three primary alignment groups available from Merced to Fresno (W99, SP and BNSF) produce 25 variations when considered as station-to-station routes between the two cities.

### **S.1.5 Segment 5: Fresno to Tulare**

Six station sites have been considered in Fresno. Three are each reached from the north from the SP, BNSF or W99 high-speed alignments. S51 Fresno Downtown, S52 Fresno Chandler Field and S56 Fresno West can be connected toward Tulare County by one of the same SP, BNSF or W99 routes. S53 Fresno BNSF Amtrak and S54 Fresno Airport were found to have no acceptable alignment connections. The S55 Fresno East station is connected through the area exclusively via the E99 alignment.

The four primary alignment groups available from Fresno to Tulare produce 15 variations when considered as station-to-station routes between the two cities.

### **S.1.6 Segment 6: Tulare to Bakersfield**

Five station sites have been considered in Tulare and Kings County. Each is served exclusively by one of the four major high-speed alignments, although other cross connections could be considered. S61 Visalia

Airport and S63 Tulare Airport lie on the SP alignment. S62 Hanford is on the BNSF route. S64 has an E99 alignment and S65 a W99 alignment.

The four primary alignment groups available from Tulare to Bakersfield (BNSF, W99, SP and E99) produce 29 variations when considered as station-to-station routes between the two cities.

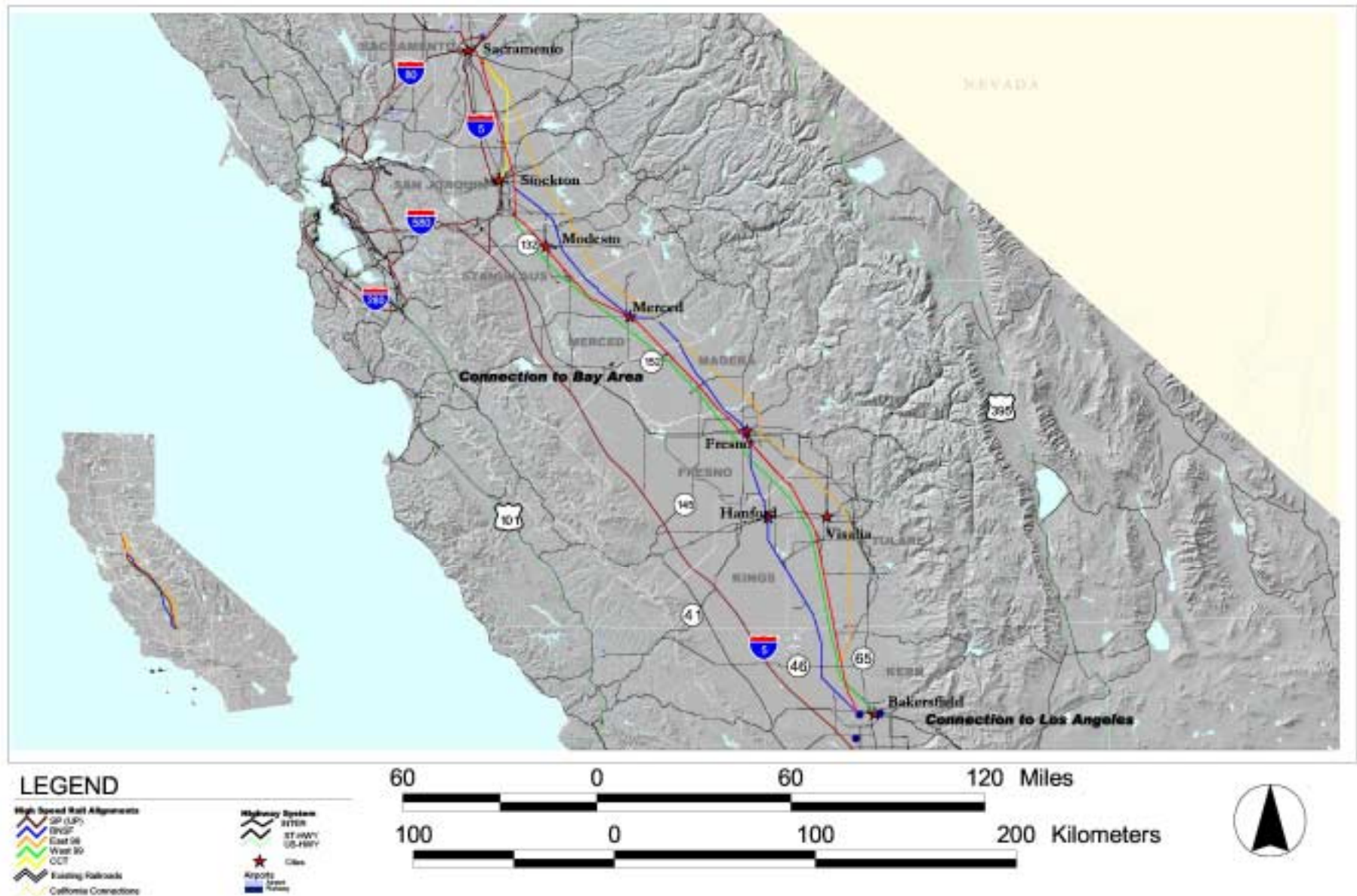
### **S.1.7 Segment 7: Bakersfield to Los Angeles Connections**

Seven station sites have been considered in the Bakersfield area. All can be reached from the north via each of the SP, W99 and E99 high-speed alignments. They are S71 Bakersfield Truxton, S72 Bakersfield Golden State, S73 Bakersfield Airport, S74 Bakersfield West, S75 Bakersfield East and S77 Bakersfield South. S71 Truxton and S76 Old Amtrak can be reached from the BNSF only by a lower-speed station stopping track alignment.

South of Bakersfield, no rail connections exist except the Union Pacific (SP) freight line toward Mojave and the Techachapi Loop. Stations S74 Bakersfield West and S77 Bakersfield South cannot reach the Mojave route. All stations except S75 Bakersfield East can be linked to the connection points at the I-5 Grapevine or near Comanche Point.

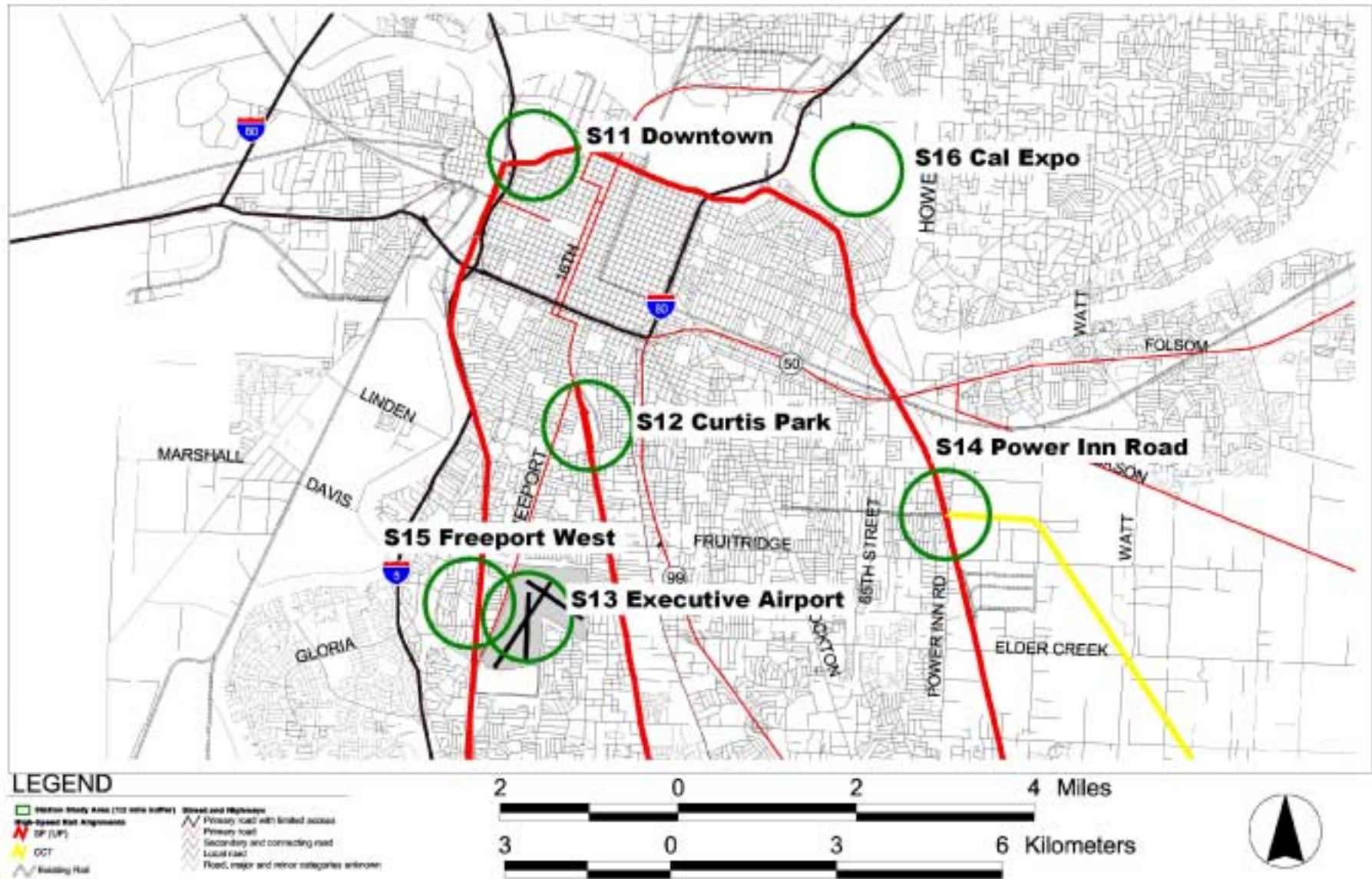
The three connection points to the Bakersfield to Los Angeles produce 16 variations when considered as station-to-connection point routes.

## SACRAMENTO-BAKERSFIELD CORRIDOR HIGH-SPEED RAIL ALTERNATIVES

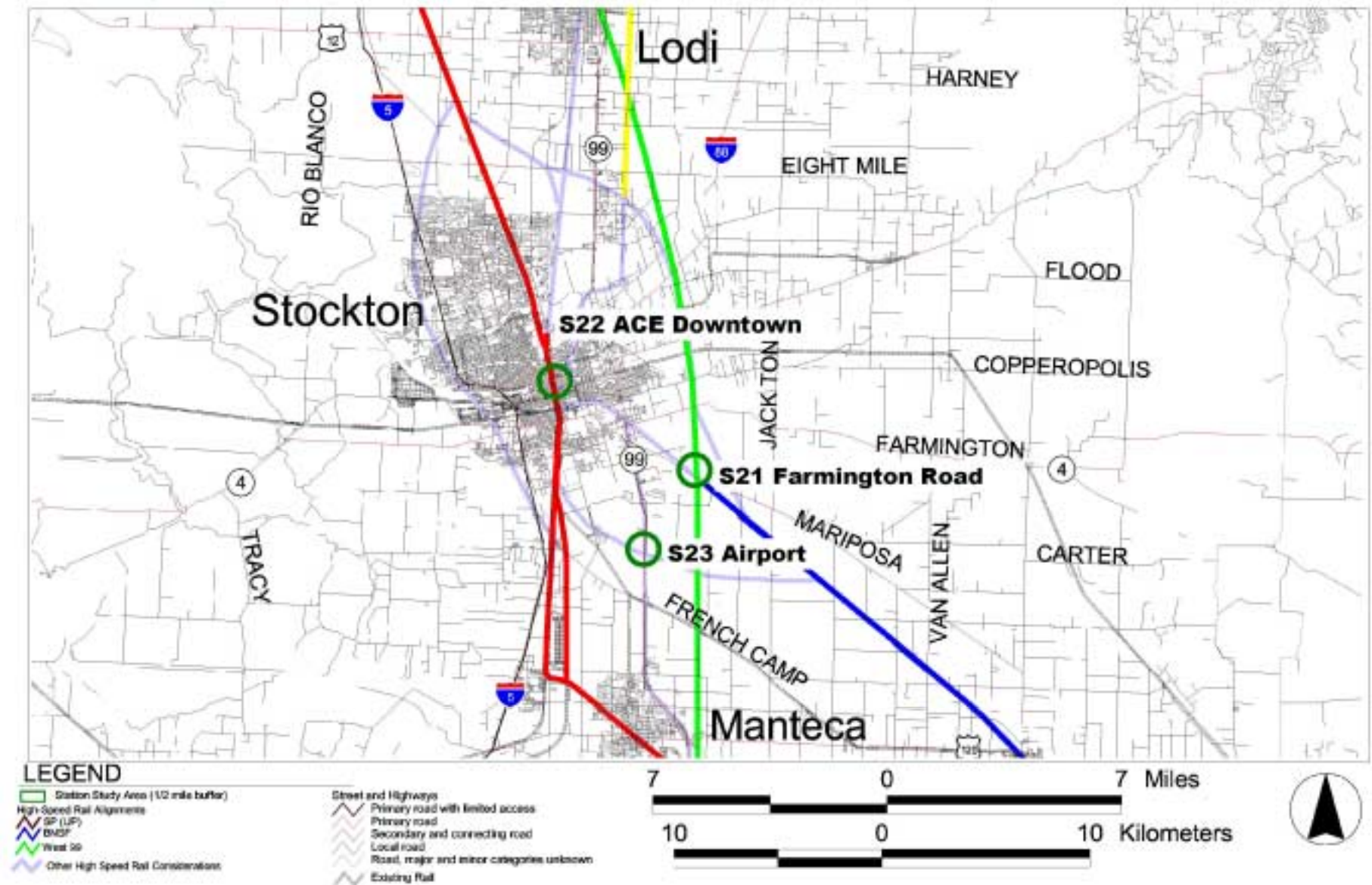




## SACRAMENTO STATION SITES

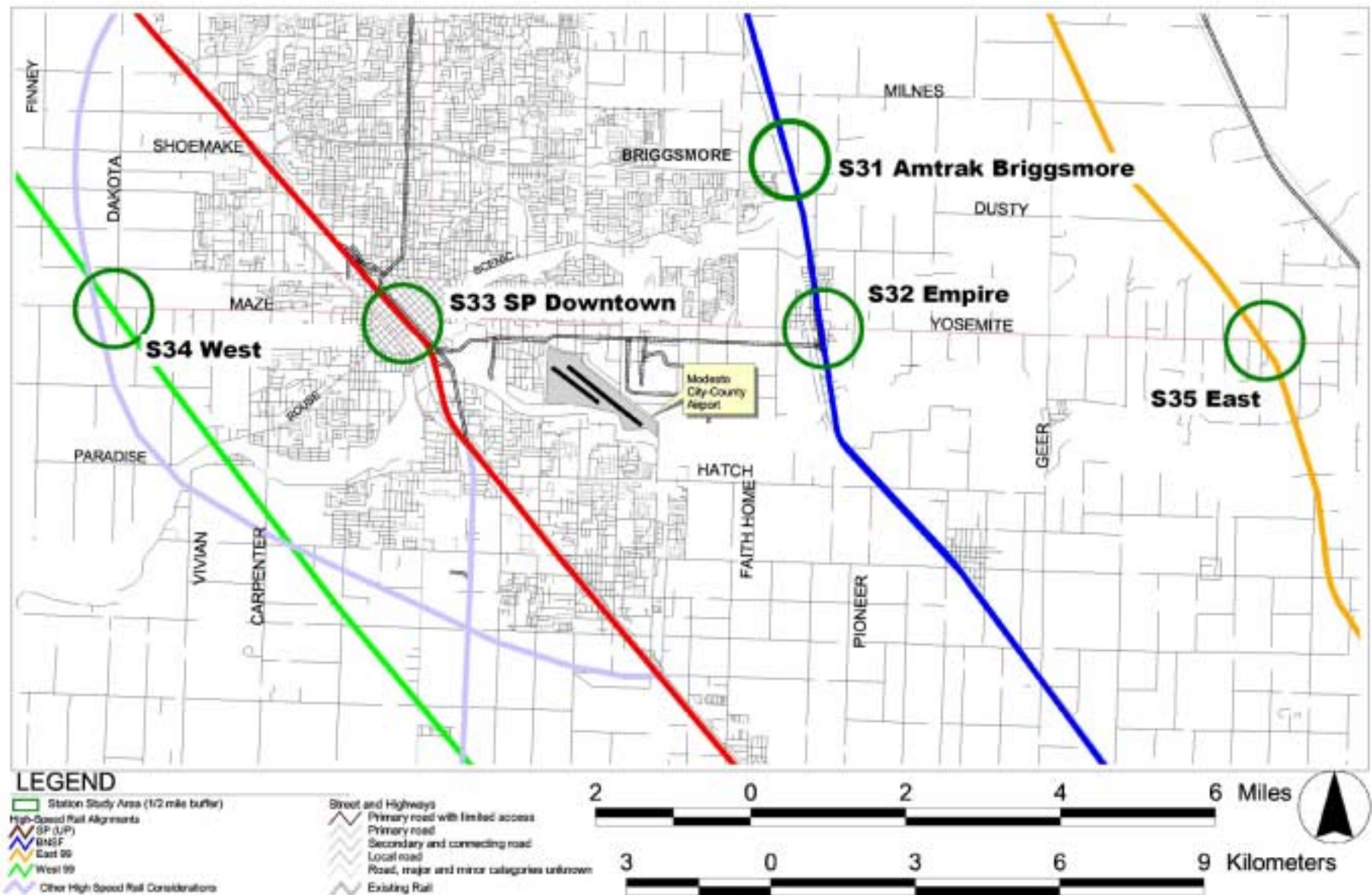


## STOCKTON STATION SITES

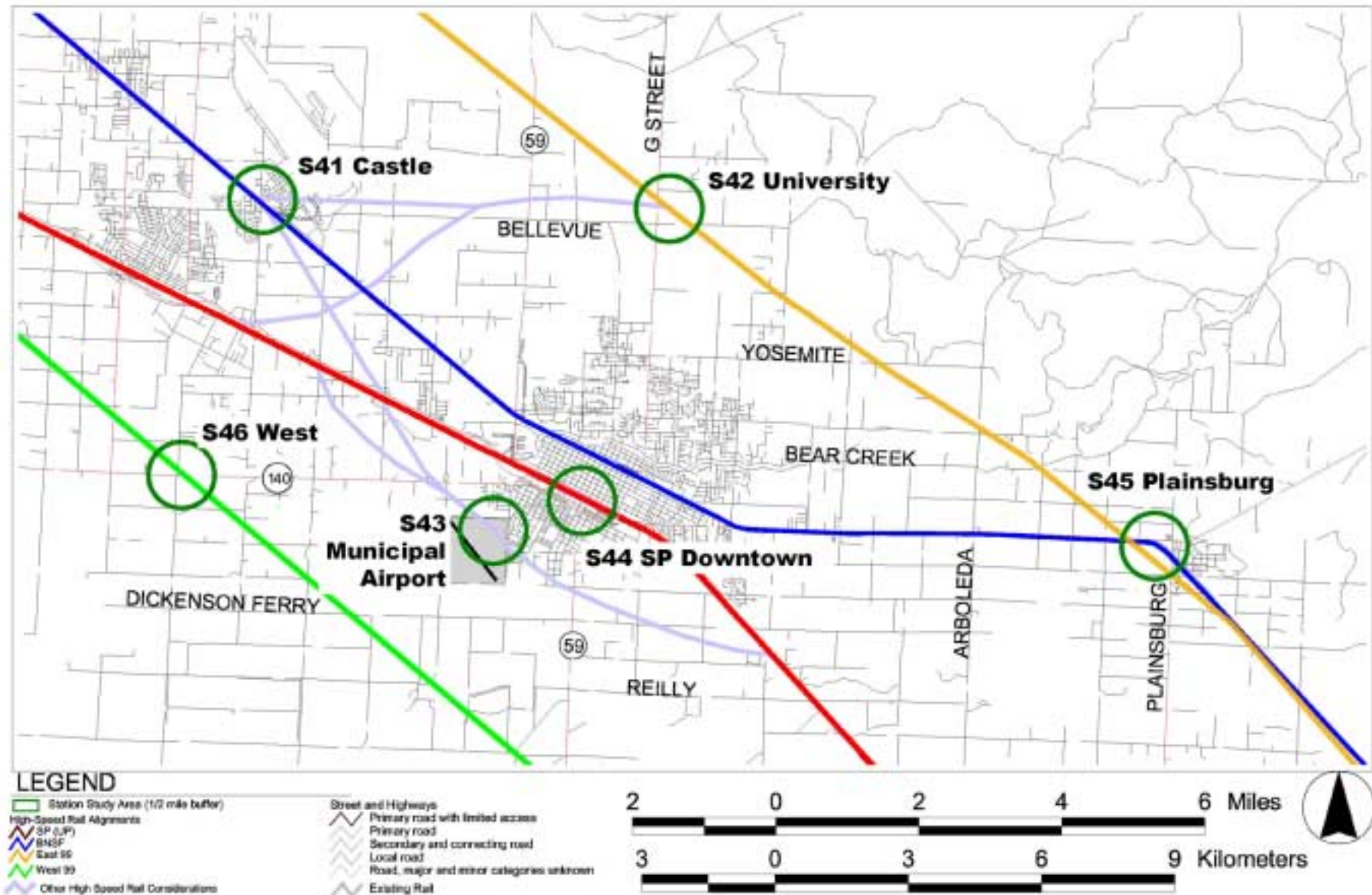




## MODESTO STATION SITES

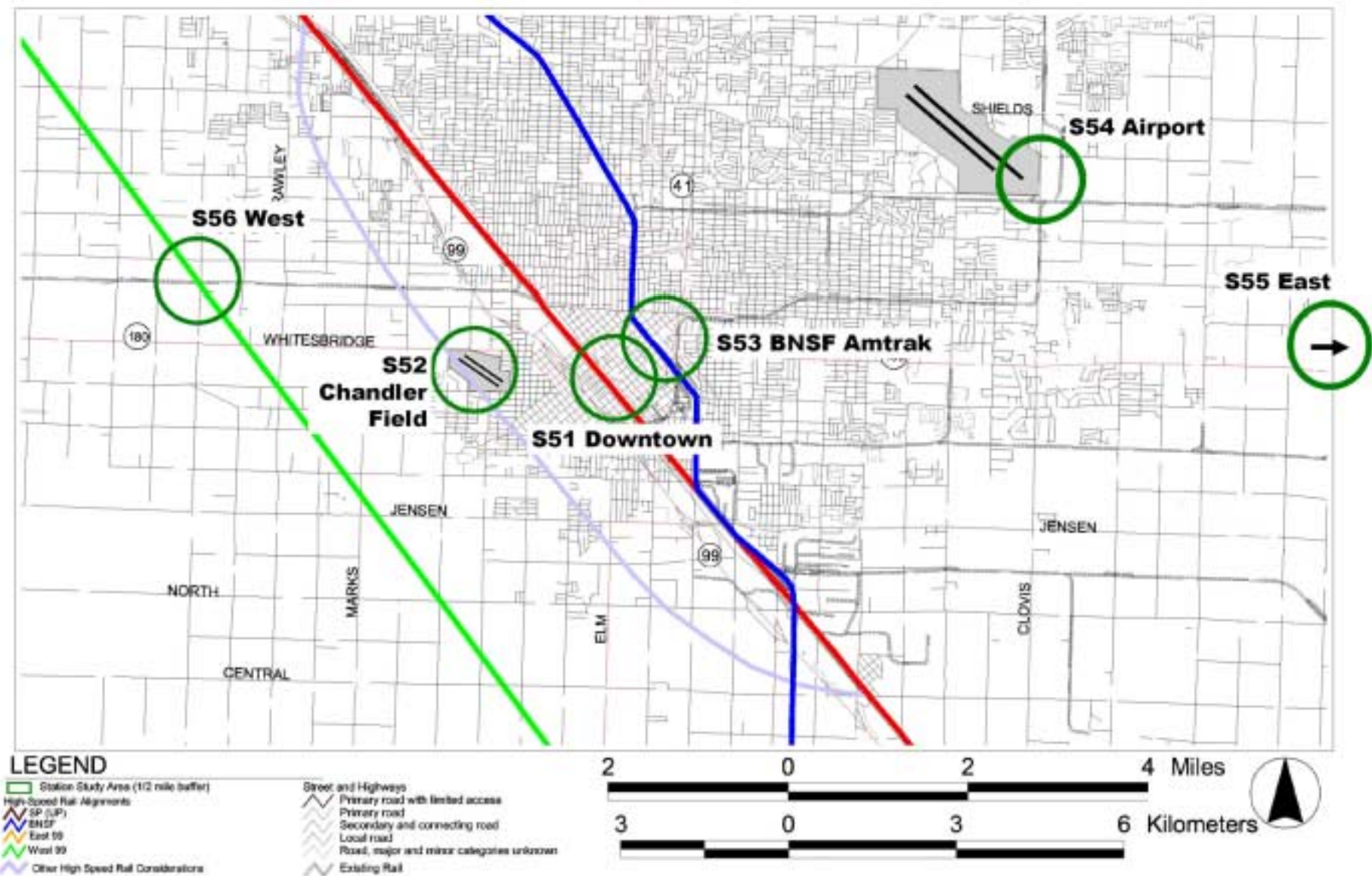


## MERCED STATION SITES

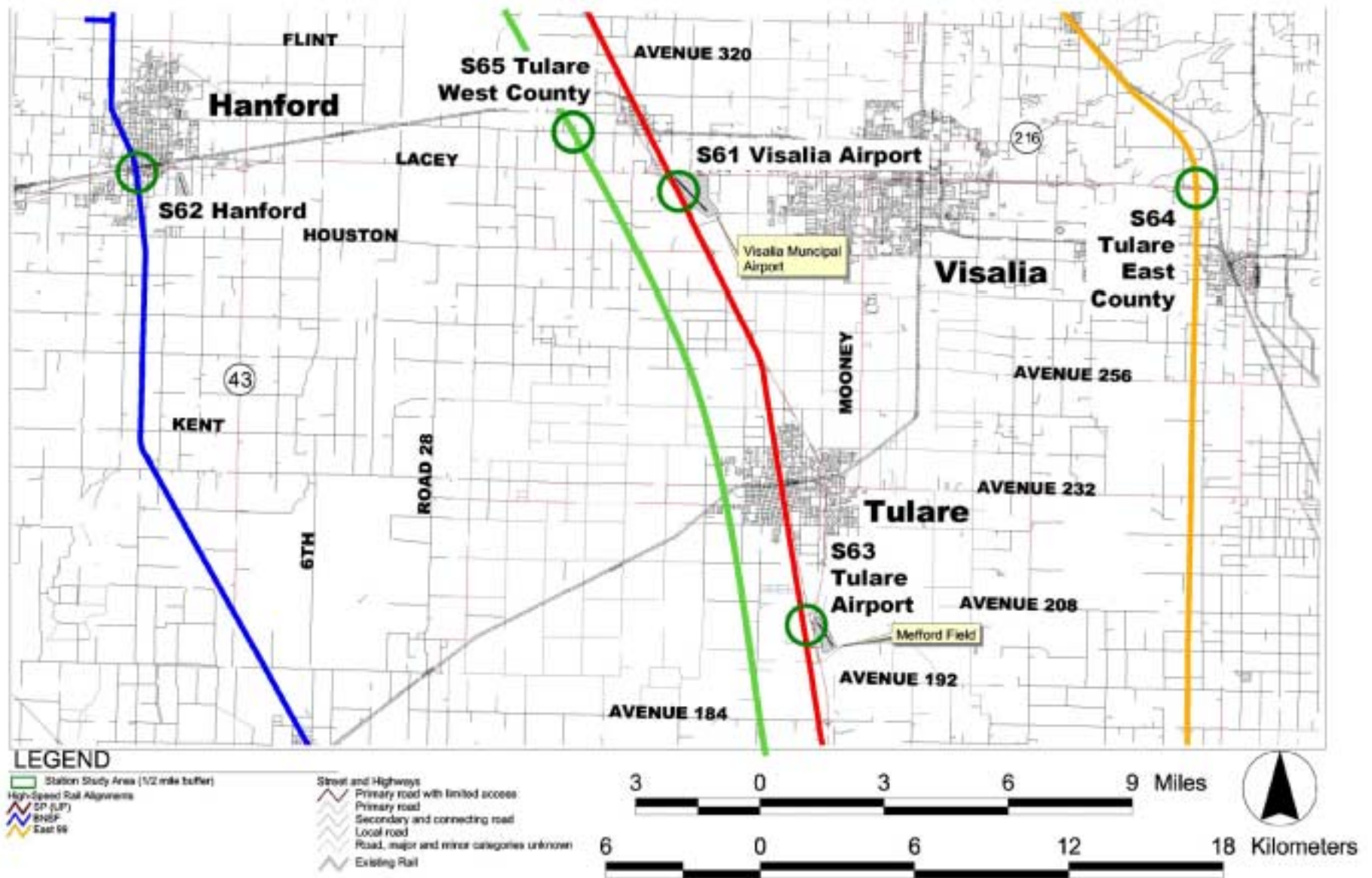




## FRESNO STATION SITES

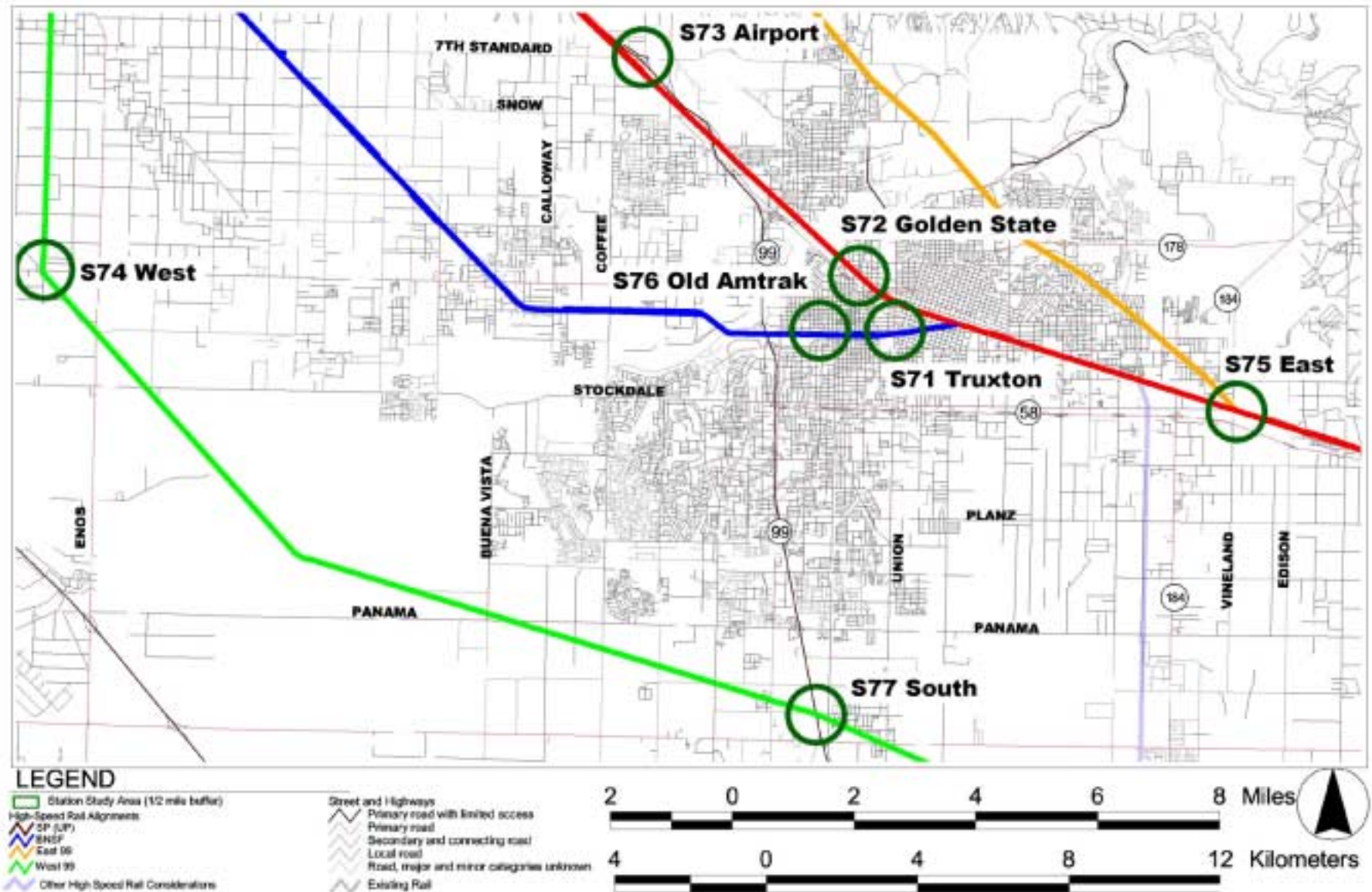


## TULARE STATION SITES





## BAKERSFIELD STATION SITES



## S.2 ALIGNMENT AND STATION OPTIONS EVALUATION

Alignments through the Sacramento to Bakersfield corridor cover roughly 270 miles (435 km) through an area characterized by agricultural land uses and growing metropolitan areas. The high-speed train system through the region would provide connectivity between Northern and Southern California. The high-speed train system would also connect the Central Valley cities themselves to Northern and Southern California destinations.

The regional screening evaluation analyzes 36 possible station sites and 147 possible alignment options to connect them throughout the seven segments of this corridor. Over the course of the screening evaluation process, it became apparent that there were two major considerations within the Sacramento to Bakersfield section of the High Speed Train Program. First, this section of the statewide system serves as the connector between Northern California (Sacramento and the Bay Area) and Southern California (Los Angeles and beyond). As such, it needs the most direct route and fastest alignment feasible for through trains. Second, the route through the Central Valley provides connectivity for the communities along the line. As such, station sites in the Central Valley cities are a key element in the decision process. As part of the formal environmental process, extensive outreach and involvement activities have occurred throughout this corridor, including: Town Hall and Scoping meetings; meetings with and presentations to elected officials; and interviews with key stakeholders. This outreach and public/agency involvement identified a higher interest in the consequences, benefits, and impacts of the choice of station locations rather than alignments. Station location selection has to be balanced with the need to develop a high-speed train route throughout the Central Valley that also attains the overall objectives established by the Authority.

Use of downtown station sites is strongly preferred locally. These stations exhibit strong connectivity to other modes and are close to central destinations in the cities. They are also sometimes difficult to serve on high-speed alignments. Therefore, the concept of a separate two-track express through route away from the metropolitan center for trains not stopping at a station has been carried through the regional analysis, wherever applicable. Since the length of track required to accelerate from a station stop or to slow for a station stop may be more than three miles on either side of the station, the length of four-track main line sections required in station areas can exceed six miles. The incremental cost for these two separated two-track alignments, a so-called "Italian solution," may not be prohibitive. Its operational benefits and its ability to reduce impacts in cities (that is, only two tracks at the urban station stop) may also commend its use in cities where its use is not absolutely essential to fit a station. In this way, the more desirable station options and the more desirable alignments can be made compatible within the statewide system. However, this solution of stations off the main line will be more costly than using outlying stations within the main line alignment.

The following discussion summarizes the key issues identified in the evaluation of the alignment corridors and station options in each segment. Tables S.2.1A through S.2.7B summarize the level to which each station and alignment option attains the objectives established by the Authority.

### S.2.1 Segment 1: Sacramento to Stockton

#### A. STATIONS

For Sacramento, the choice of a terminal station is between a downtown site (S11) or one of four suburban sites.

S11 Sacramento Downtown. A downtown site connects to other modes most effectively and is closest to government and business destinations. The site also connects best to any northern extension of the system in the future. The central location and the numerous transit connections



also make the site the most costly. Using a southwestern approach to the station would call for underground tracks and platforms, which introduces the complication of the site's proximity to the Sacramento River. Using an eastern approach allows the tracks and platforms to be elevated above the existing station tracks. Both approaches will incur substantial capital costs and will require extensive design coordination with other station area users.

**S12 Sacramento Curtis Park.** This close-to-downtown site is located on the WP alignment, the most direct existing rail route to the city. Access to the site on the city street grid is constrained, however, and the surrounding land uses are less compatible with a large terminal station than other options.

**S13 Sacramento Executive Airport.** This near-suburban site has the advantage of sharing use with the city's general aviation airport, a large plot of land already in transportation uses. It connects with the SP River line and the WP route for a direct connection to Stockton. Access is easier and land uses are more compatible than at the nearby S15 Freeport West site. The latter is surrounded by residential properties but is actually astride an existing rail alignment.

**S14 Power Inn Road.** This suburban site, the most distant from downtown is located in an industrial area southeast of the city center. The station option can be served either by the SP or CCT and is on the eastern rail approach to the downtown area.

A site at the Cal Expo fairgrounds was put forward during the public comment phase of the program. Significant environmental factors and the lack of clear access to the site by either rail or road led to its removal from further consideration.

Environmentally, all of the station sites in Sacramento lie to varying degrees within the 100-year floodplain. None, however, contain wetlands, sensitive biological habitats, farmlands, or stream or scenic corridor crossings. The differences among stations stem primarily from land use, visual, environmental justice, and historic/parkland characteristics. Station areas with fewer potential land use conflicts and visual impacts (i.e., larger percentages of industrial and transportation-related land uses) have the tradeoff of containing larger numbers of environmental justice communities. These are Downtown, Executive Airport, and Freeport West. The Downtown Station site contains a significant number of nationally registered historic properties (7), whereas, the Curtis Park site has a considerable acreage in parklands (about 20).

## B. ALIGNMENTS

Two alignments reach downtown from the other station sites, but introduce engineering and environmental factors that increase complexity and cost. The SP River Line to the **WP** alignment defines a western route to downtown. It comes the closest to parklands and traverses environmentally sensitive areas south of the city. However, it is a direct route to downtown with no substandard curves that would slow approaching trains. The eastern approach, the SP Fresno line, the main **SP** route, has the most interactions with existing freight railroad operations north and south of the city and would require slow running for the last six miles to the downtown station site. It also would have impacts on residential neighborhoods east of downtown.

Once out of downtown, three alignment groupings, the Western Pacific (**WP**), the Southern Pacific (**SP**) and the Central California Traction (**CCT**) reach south toward Stockton. Of these, the WP is the most direct route to Stockton. The SP line is surrounded by more development and infrastructure, increasing impacts and remains an important freight route in the region. The study route proposes a bypass loop to the east of the City of Lodi that partially joins the CCT route to avoid the cost and disruption of a high-speed line through the center of that city. The CCT alignment is longer, narrow and hard to connect to existing alignment segments to the



south, but would pose fewer difficulties connecting to a new high-speed alignment. The Lodi bypass route from the SP would also join the CCT route east of Lodi. The CCT route holds interest because of the low population along its route and the possibility that its freight rail owners may seek to abandon the line.

## S.2.2 Segment 2: Stockton to Modesto

### A. STATIONS

Station options in Stockton include a downtown and two suburban sites, at Farmington Road and at the Stockton Airport.

S21 Farmington Road. This option corresponds to a plan by Amtrak to combine San Joaquin rail service at a single Stockton station along the BNSF line. The site is close to the SR 99 Freeway, but is away from recent growth areas in the Stockton area.

S22 ACE Downtown. This option would concentrate rail service in the downtown area, close to the Altamont Commuter Express commuter rail station. The site is small and the approaches on the WP or SP are narrow and pose engineering challenges. Some land assembly could be undertaken by the City of Stockton.

S23 Stockton Airport. This option would combine compatible transportation uses on a large plot of land. However, the site is well away from downtown and from the growing areas of Stockton. The site would incur almost all of the alignment difficulties of the downtown station option, since access to the site from Sacramento would use the same lower-speed two-track alignment through downtown. While the airport site would have more room for a station, this would not outweigh the other advantages of the downtown site, given the similar alignment challenges.

Environmentally, the Farmington Road and Airport station options have potential impacts on farmlands, stream crossings, and the 100-year floodplain. On the other hand, they have fewer impacts on current land uses than a downtown site. The ACE Downtown Station has the fewest environmental constraints but has the highest percentage of potential conflicts with existing land uses, the greatest number of minority populations and is the only station site in this city with national register historic properties and parklands in its proximity. However, these factors would be expected to occur in a downtown setting.

### B. ALIGNMENTS

A single high-speed new alignment allows high-speed running near the city. The Farmington Road alignment/station site is the only investigated option that allows the possibility of high-speed running near the city, although the approach to the site may be easier and cheaper if an express through route with a set of station stopping tracks is also used here. The downtown and airport stations must be accessed by lower-speed alignments, which will still be challenging to construct. The chief obstacle to the downtown alignment is the need to grade separate the line from both the crossing of the BNSF and UP main lines south of the site and from the downtown street grid. An aerial alignment would encounter the SR 4 freeway structure in the area, whereas a trench alignment would need to contend with the high water table in this inland port city. Alignments to the south of Stockton are a new W99 route to the south and the BNSF mainline to the southeast, of which the BNSF is the more direct route toward Modesto and beyond. A new W99 high-speed alignment from the northeastern high-speed route would not serve any of the three investigated station sites. Access to the W99 high-speed route from the S22 ACE





Downtown station would depart from the WP/SP lower-speed alignment near the Lathrop ACE station.

### S.2.3 Segment 3: Modesto to Merced

#### A. STATIONS

Three station types are possible in Modesto. The S33 SP Downtown station includes the city's transit hub, but is a small site that would be accessible only by a slower-speed urban alignment. High-speed trains would need to be on a separate through alignment around the downtown core, which could be provided along the W99 alignment. The SP rail route through the city is very constrained, with development and freight rail uses close to the tracks throughout Modesto. The local street network crosses the tracks at several places. Grade separations in the city would be expensive and visually disruptive in an aerial configuration.

Suburban sites include the new S31 Amtrak Briggsmore option, the site of a new Amtrak station and the S32 Empire option, which is the historical Modesto station site in earlier times.. The Amtrak Briggsmore and Empire sites lies on the more direct BNSF route from Stockton. Of the two, the former shows more promise for Amtrak interaction and would minimize the local traffic improvements that would be necessary at Empire. Freight rail interactions at Empire would also be extensive. Both sites could benefit from an express through track route, even though this would not be essential for construction. Again, an express through route would be essential for the SP downtown station in the city.

New outlying stations are also possible at S34 Modesto West on the new W99 alignment or at S35 Modesto East on the new E99 alignment. Each is farther from the metropolitan area than the other sites, increasing travel times to the stations from the population and employment centers where riders would travel.

Environmentally, the outlying stations, Modesto West and East, are noteworthy in that they encounter few existing environmental constraints, except that they are both entirely devoted to agricultural production. Only the Downtown location contains environmental justice communities, historic properties (1), and parklands (.7 acre). The two suburban sites are markedly different in their characteristics: whereas the Amtrak Briggsmore site has relatively few conflicting land uses and contains a small amount of wetlands and lies within the 100-year floodplain, the Empire site is one-half residential, a generally conflicting land use, but otherwise has few environmental constraints.

#### B. ALIGNMENTS

Alignments on the east side of the SR 99 Freeway (BNSF and E99) are shorter than those on the west side (SP and W99) in the segments north of Merced. Thus faster travel times are possible on the former. There are no convenient connecting points among the general alignments between Stockton and Merced, so the choice of the most direct route in this segment would require an east side Modesto station. The SP alignment in this segment would impact more and larger communities, increasing costs for construction. The W99 avoids this impact, but runs in otherwise agricultural lands and is the longest of the four routes. On the east side of the Valley, the BNSF touches fewer communities than the SP and runs primarily through agricultural areas. The E99 alignment, the most direct, would be new and farther from the metropolitan area, running also in agricultural areas.



## S.2.4 Segment 4: Merced to Fresno

### A. STATIONS

One downtown and four suburban stations make up the options for Merced.

The four suburban sites are located on high-speed alignments and offer differing characteristics. S41 Castle uses decommissioned military land. The site is close to the BNSF main line and thus easily accessible by a short loop alignment into the large airbase. The exact location for a high-speed rail station and associated alignment would be part of the base reuse process. The site can be very compatible for a station with little disruption of local access patterns. The site can be connected to all alignments to the south, although is limited to the north to east side alignments (BNSF and E99). Easy access from the developing university campus and community would occur via a new highway along Bellevue Avenue.

S42 Merced University would be on new alignment near the UC Merced campus and community. This station and associated alignment can also be planned integrally with the new university and city planning process, which will direct development to the north of Merced. However, a standard configuration station at this site would entail four high-speed tracks running through the proposed development areas. The use of a University station site would keep the high-speed alignment on the east side of the Valley until closer to Fresno in Madera County.

S43 Merced Airport would share land with aviation uses at the existing municipal airport. The station is close to the SR 99 Freeway but is away from the new university and the areas slated for growth in the area. The site lies on the shortest crossover from the east side alignments to the west side ones.

The S44 SP Downtown option would be the only one to require a slower-speed approach track and an outlying express through route for high-speed trains, due to a constrained rail route through the downtown area. Existing rail uses and multiple crossings of the local street grid require either trenching or aerial structures through the most densely built parts of central Merced, raising construction costs and causing visual impacts. Of the Merced station options, this would be the most costly and least compatible with existing land uses.

S45 Merced Plainsburg lies on the existing BNSF rail line in the settlement of Planada. The E99 alignment would also rejoin the BNSF corridor at this site. The site is the most distant from the established and developing areas of Merced and well into areas that are expected to remain in agricultural land uses.

Environmentally, only one of the Merced Stations, the SP Downtown Station, is highly urbanized. The other four stations are still predominantly agricultural and hence do not involve land uses that are inherently incompatible or visually sensitive to a HSR station and do not contain cultural resources. Agricultural uses are prevalent near the outlying sites, however, and their distance from activity centers would create longer local access paths to the stations. The SP Downtown Station affects the greatest number of minority communities, historic resources, parklands, sensitive land uses, and scenic crossings, and the second highest amount of 100-year floodplain. The four stations in more agricultural areas vary across the board in their environmental opportunities and constraints. For example, the Castle site has an extensive amount of sensitive biological habitat; the University site has the greatest amount of wetlands; the Airport site has the greatest acreage in the 100-year floodplain; and the Airport and Plainsburg sites have the greatest minority populations outside the SP Downtown site.



## B. ALIGNMENTS

This segment has great alignment flexibility, since all four major routes through the Central Valley region are closest to each other in this segment. Interconnections would be relatively easy. To maintain the most direct through route in the region, the high-speed line would need to cross from the BNSF or E99 route to the W99 or SP routes near Merced. Opportunities to accomplish this may be designed in conjunction with the new highway being planned to serve the UC Merced campus and community. Using a segment of the E99 alignment to serve the Merced University station would require the high-speed alignment to remain on the BNSF route for some distance to the south. Crossover to the SP or W99 would then require a longer connector, but could be designed in conjunction with the Fresno rail consolidation process. To the south of Merced, the BNSF and the E99 alignments merge and diverge as they move farther to the east, which also lengthens the distance toward Fresno on these eastern alignments. Of the shorter western alignments, the W99 would impact fewer areas of population and freight rail activity, but would have greater impacts on agricultural lands. The SP alignment bisects most settlements in the area and runs parallel to the SR 99 Freeway, where most development in the region has occurred.

### S.2.5 Segment 5: Fresno to Tulare

#### A. STATIONS

Fresno's six station sites display great diversity of location and impacts. Three of them (Fresno Downtown, Fresno West and Fresno East) can be located on high-speed alignments.

The S51 Fresno Downtown station must be designed in conjunction with the ongoing rail consolidation process to ensure sufficient running space in the corridor for high-speed train system requirements. It is now assumed that a four-track high-speed station can fit on this site with existing and future freight rail operations. The configuration of a combined freight railroad through the area is undetermined at this time. If less room is available for high-speed purposes, an express loop on the W99 alignment to the west of the city might be desirable; this arrangement would then require two tracks downtown and two to the west. The downtown site is strongest for connectivity and ridership. It is close to freeways and to urban core destinations. Depending on the exact location of the station along the SP right-of-way, a sufficiently large site can be found to accommodate what will be one of the busiest stations in the Central Valley region.

The S52 Fresno Chandler Field site would be a semi-urban site on a new alignment. The site is close to downtown on a large plot of land already in transportation uses (a general aviation airport). Nearby residential uses would increase impacts in the area, however, and these may also bring some environmental justice concerns. The site is currently not served by any rail line, so a new connector must be constructed from the W99 or the SP alignments, which would cause disruption to the land uses along the new line.

The S53 Fresno BNSF Amtrak site is Fresno's existing passenger rail station. Its site, near the Fresno City Hall, is very constrained and the BNSF mainline through Fresno has slow curves and numerous grade crossings. The alignment also runs through residential areas on a narrow single-track right-of-way, whose removal from mainline freight service is the object of the Fresno Rail Consolidation process.

The S54 Fresno Airport option would make use of a portion of the Fresno Yosemite International Airport, a large transportation site in the region. A suitable high-speed alignment to the site could not be found, however. An earlier E99 alignment to connect this site would have run on a



former rail alignment through the center of the City of Clovis and on a new alignment through parts of eastern Fresno. These impacts have been considered too disruptive. A new E99 alignment has since moved farther east of this site to make use of a conceptual joint freeway alignment.

S55 Fresno East would be an outlying station on a new conceptual joint rail and freeway alignments through the eastern portions of the Central Valley. Caltrans is in the early stages of considering a new easterly Central Valley alignment for extending SR 65 north from the Visalia area to a point in Madera County. This new station site would be located east of Fresno on an E99 shared alignment with the freeway. The station area, now in agricultural use, is considerably farther from the developed areas of Fresno and would require the longest access route of any of the Fresno station options.

S56 Fresno West would be an outlying station on a new alignment west of the city. This station would be located on the W99 route where it crosses SR 180. This site would be west of the developed and growing areas of Fresno and would be located in agricultural lands.

Environmentally, the Downtown, Chandler Field and BNSF Amtrak station locations face greater challenges in terms of land use and visual compatibility, environmental justice, and parkland considerations. The rural Fresno West and Fresno East station sites would not encounter these issues, but the tradeoff is the loss of productive and significant farmland resources. Among the urban stations, the most discriminating environmental criteria are cultural resources, flood hazards, and environmental justice (Downtown and BNSF Amtrak have historic properties, substantial amounts of the 100-year floodplain, and greater populations of minority and low-income households in their boundaries; the other stations have none or considerably less).

## B. ALIGNMENTS

All four major routes are available from Fresno to the south. The most direct alignment from the downtown station is on the SP route. An optional high-speed through route would use the same alignment as the W99 route, but without the Fresno West station along its extent. This express through track arrangement offers flexibility in the context of Fresno rail consolidation needs.

The BNSF route has constraints in the City of Fresno that make its consideration for high-speed service doubtful. The line is a single track with no excess right-of-way as it curves through the city. The line crosses many local streets and would require extensive grade separations, raising costs and visual impacts. The alignment is slightly shorter in length as it moves to the south of Fresno, but its drift toward the west places it farther from the population centers in the region between Fresno and Bakersfield.

The E99 route, although only roughly defined as a joint freeway corridor, can still be determined to be the longest route south of Fresno, adding travel time and costs. It also bypasses most of the population and employment centers of the Fresno metropolitan area.

## S.2.6 Segment 6: Tulare to Bakersfield

### A. STATIONS

The four station sites in Tulare County are similar in characteristics. All would be new stations built on mostly open land. The two airport sites are most centrally located to population centers in the area, with Visalia Airport more accessible to these than Tulare. The Visalia Airport site has much neighboring land already in public ownership and has the most compatible land uses in the area. While Hanford is an existing Amtrak station in an established community, its location is





farthest from population centers in the area and would require long access travel to reach the high-speed line.

Environmentally, all five station sites in the Visalia/Hanford/Tulare area contain extensive amounts of agricultural uses, except Hanford. While the Hanford site avoids natural resource, cultural resource, farmland, and environmental justice considerations, the station area land uses would pose land use conflicts and visual compatibility concerns as it passed through the city. The outlying station locations, Tulare East and West, would disturb the greatest amount of agricultural lands and wetlands and have the highest count of threatened and endangered species. The two airport sites, Visalia and Tulare, are fairly comparable in terms of environmental opportunities and constraints. The Visalia Airport site, however, has one stream and wetland crossing and more than twice as much acreage in the 100-year floodplain; whereas, the Tulare site has a threatened and endangered species in its station vicinity.

## B. ALIGNMENTS

The BNSF alignment is the shortest route to Bakersfield by a short increment, but the Hanford station lies too far to the west to serve the majority of the population and employment in the segment. The BNSF approach to Bakersfield also involves a relatively sharp curve in an area that is now residentially built up. The alignment cannot be easily upgraded for high-speed running at this point or through downtown Bakersfield. The next most direct routes are the W99 and SP alignments. The SP alignment serves the two airport stations most directly, but also runs closest to the developed areas along the SR 99 Freeway. The E99 alignment is longest and approaches the Sierra foothills too closely, raising the need for more grading than on other alignments. It also misses most of the population and employment areas of the segment. Alignment and station site factors in Fresno and Bakersfield will have a strong influence on Tulare area choices, since each station in this region is bound for the most part to a single alignment.

## S.2.7 Segment 7: Bakersfield to Los Angeles Connections

### A. STATIONS

Bakersfield has seven station sites in urban and suburban locations. A local task force has recommended three of them (S71 Bakersfield Truxton, S72 Bakersfield Golden State and S73 Bakersfield Airport) for further study. The downtown sites, S71 Bakersfield Truxton at the new Amtrak station and S72 Bakersfield Golden State, a site just north of the Civic Center on Golden State Blvd, are being considered in the context of a comprehensive update of transportation plans. Recently adopted local traffic alternatives connect both the S71 Truxton option the S72 Golden State downtown options to the local freeway network. However, the freeway alignments chosen remove the conceptual Union Avenue high-speed rail corridor from the Truxton site. Suburban sites at S74 Bakersfield West and S77 Bakersfield South would lie on a new W99 alignment. The S74 Bakersfield West site is located so as to avoid extensive new residential growth areas. It is far from downtown and is farthest from existing and planned freeway access. The S77 Bakersfield South site would be relatively closer to downtown and adjacent to the SR 99 Freeway. The S73 Airport site lies on the Union Pacific (SP) alignment near the SR 99 Freeway and 7<sup>th</sup> Standard Road, which is also planned for freeway expansion. In addition the recently retired Amtrak station site has been studied as S76 Bakersfield Old Amtrak. A high-speed express through track on a W99 alignment, while not imperative, can reduce construction, operating and environmental impacts for a downtown station in Bakersfield.

Environmentally, only the S76 Old Amtrak and S74 West Station sites contain land uses that would be considered incompatible or visually sensitive to a HSR station. Few of the station sites are environmentally constrained, as most involve no or little water resources, environmental



justice communities, cultural resources, or parklands. The only exceptions are the Truxton Station (environmental justice) and Golden State (water resources). State-designated important farmlands and threatened and endangered species are a consideration for three stations, the Bakersfield Airport, West, and East Stations. The Bakersfield South Station site had the least impacts overall, while the Golden State site had the most.

## B. ALIGNMENTS

Connections to the Los Angeles Basin at either the I-5 Grapevine or the Comanche Point connections to the Los Angeles area will require new rights-of-way in agricultural areas without current railroad facilities. Care has been taken to define the new lines as much as possible along existing section roads or along utility easements. This would minimize the introduction of new parcel segmentation. Overall, the impacts of these new lines will be similar to each other in the Central Valley portions of the Bakersfield to Los Angeles region. The choice of one route over another will depend on factors relating to the most desirable crossing of the mountains in the Bakersfield to Los Angeles region.



**Table S.2.1A**  
**Sacramento to Bakersfield – High-Speed Train Station Attainment of Objectives**  
**Sacramento Stations**

Objective	Station S11 Sacramento Downtown	Station S12 Sacramento Curtis Park	Station S13 Sacramento Executive Airport	Station S14 Sacramento Power Inn Road	Station S15 Sacramento Freeport West		
Maximize Ridership/Revenue Potential	5	3	3	3	2		
Maximize Connectivity and Accessibility	5	3	2	2	2		
Minimize Operating and Capital Costs	2	3	4	3	4		
Maximize Compatibility with Existing and Planned Development	4	1	4	3	2		
Minimize Impacts to Natural Resources	5	4	4	3	5		
Minimize Impacts to Social and Economic Resources	3	4	4	5	3		
Minimize Impacts to Cultural Resources	3	1	5	3	3		
Maximize Avoidance of Areas with Geologic and Soils Constraints	ND	ND	ND	ND	ND		
Maximize Avoidance of Areas with Potential Hazardous Materials	ND	ND	ND	ND	ND		

1 2 3 4 5

Least Favorable

Most Favorable

**ND = NOT A DISTINGUISHING FACTOR**

**Table S.2.1B**  
**Sacramento to Bakersfield – High-Speed Train Alignment Attainment of Objectives**  
**Sacramento to Stockton Segment**

Maximize Connectivity and Accessibility	4	3	3	
<b>Objective</b>	<b>WP/SP RIV</b>	<b>SP</b>	<b>CCT/SP</b>	
Maximize Ridership/Revenue Potential	4	3	3	
Minimize Operating and Capital Costs	3	3	3	
Maximize Compatibility with Existing and Planned Development	3	3	3	
Minimize Impacts to Natural Resources	3	3	3	
Minimize Impacts to Social and Economic Resources	3	2	3	
Minimize Impacts to Cultural Resources	3	2	2	
Maximize Avoidance of Areas with Geologic and Soils Constraints	ND	ND	ND	
Maximize Avoidance of Areas with Potential Hazardous Materials	ND	ND	ND	

1 2 3 4 5

Least Favorable

Most Favorable

**ND = NOT A DISTINGUISHING FACTOR**



**Table S.2.2A**  
**Sacramento to Bakersfield – High-Speed Train Station Attainment of Objectives**  
**Stockton Stations**

Objective	Station S21 Stockton Farmington Rd	Station S22 Stockton ACE Downtown	Station S23 Stockton Airport				
Maximize Ridership/Revenue Potential	3	4	3				
Maximize Connectivity and Accessibility	3	5	2				
Minimize Operating and Capital Costs	4	1	2				
Maximize Compatibility with Existing and Planned Development	3	2	4				
Minimize Impacts to Natural Resources	2	5	3				
Minimize Impacts to Social and Economic Resources	4	3	2				
Minimize Impacts to Cultural Resources	5	1	5				
Maximize Avoidance of Areas with Geologic and Soils Constraints	ND	ND	ND				
Maximize Avoidance of Areas with Potential Hazardous Materials	ND	ND	ND				

1 2 3 4 5

Least Favorable

Most Favorable

**ND = NOT A DISTINGUISHING FACTOR**

**Table S.2.2B**  
**Sacramento to Bakersfield – High-Speed Train Alignment Attainment of Objectives**  
**Stockton to Modesto Segment**

Objective	W99	BNSF		
Maximize Connectivity and Accessibility	3	4		
Maximize Ridership/Revenue Potential	4	4		
Minimize Operating and Capital Costs	3	3		
Maximize Compatibility with Existing and Planned Development	3	4		
Minimize Impacts to Natural Resources	3	4		
Minimize Impacts to Social and Economic Resources	3	3		
Minimize Impacts to Cultural Resources	3	3		
Maximize Avoidance of Areas with Geologic and Soils Constraints	ND	ND		
Maximize Avoidance of Areas with Potential Hazardous Materials	ND	ND		

1 2 3 4 5

Least Favorable

Most Favorable

**ND = NOT A DISTINGUISHING FACTOR**

**Table S.2.3A**  
**Sacramento to Bakersfield – High-Speed Train Station Attainment of Objectives**  
**Modesto Stations**

Objective	Station S31 Modesto Amtrak Briggsmore	Station S32 Modesto Empire	Station S33 Modesto SP Downtown	Station S34 Modesto West	Station S35 Modesto East		
Maximize Ridership/Revenue Potential	3	3	4	2	2		
Maximize Connectivity and Accessibility	3	2	3	1	1		
Minimize Operating and Capital Costs	4	3	2	5	5		
Maximize Compatibility with Existing and Planned Development	3	2	3	4	3		
Minimize Impacts to Natural Resources	2	4	4	4	3		
Minimize Impacts to Social and Economic Resources	4	4	3	3	5		
Minimize Impacts to Cultural Resources	5	5	1	5	5		
Maximize Avoidance of Areas with Geologic and Soils Constraints	ND	ND	ND	ND	ND		
Maximize Avoidance of Areas with Potential Hazardous Materials	ND	ND	ND	ND	ND		

1 2 3 4 5

Least Favorable

Most Favorable

**ND = NOT A DISTINGUISHING FACTOR**

**Table S.2.3B**  
**Sacramento to Bakersfield – High-Speed Train Alignment Attainment of Objectives**  
**Modesto to Merced Segment**

Objective	W99	BNSF	UP	E99
Maximize Ridership/Revenue Potential	4	3	4	3
Maximize Connectivity and Accessibility	3	3	3	3
Minimize Operating and Capital Costs	4	4	2	4
Maximize Compatibility with Existing and Planned Development	3	3	2	3
Minimize Impacts to Natural Resources	3	4	4	4
Minimize Impacts to Social and Economic Resources	4	4	3	4
Minimize Impacts to Cultural Resources	3	5	3	5
Maximize Avoidance of Areas with Geologic and Soils Constraints	ND	ND	ND	ND
Maximize Avoidance of Areas with Potential Hazardous Materials	ND	ND	ND	ND

1 2 3 4 5

Least Favorable

Most Favorable

**ND = NOT A DISTINGUISHING FACTOR**



**Table S.2.4A**  
**Sacramento to Bakersfield – High-Speed Train Station Attainment of Objectives**  
**Merced Stations**

Objective	Station S41 Merced Castle	Station S42 Merced University	Station S43 Merced Municipal Airport	Station S44 Merced SP Downtown	Station S45 Merced Plainsburg		
Maximize Ridership/Revenue Potential	3	3	3	4	3		
Maximize Connectivity and Accessibility	2	2	2	4	1		
Minimize Operating and Capital Costs	4	4	4	1	3		
Maximize Compatibility with Existing and Planned Development	5	3	4	1	3		
Minimize Impacts to Natural Resources	3	2	3	4	3		
Minimize Impacts to Social and Economic Resources	4	3	3	3	2		
Minimize Impacts to Cultural Resources	5	4	5	2	5		
Maximize Avoidance of Areas with Geologic and Soils Constraints	ND	ND	ND	ND	ND		
Maximize Avoidance of Areas with Potential Hazardous Materials	ND	ND	ND	ND	ND		

1 2 3 4 5

Least Favorable

Most Favorable

**ND = NOT A DISTINGUISHING FACTOR**

**Table S.2.4B**  
**Sacramento to Bakersfield – High-Speed Train Alignment Attainment of Objectives**  
**Merced to Fresno Segment**

Objective	W99	E99	UP	
Maximize Connectivity and Accessibility	3	2	3	
Maximize Ridership/Revenue Potential	4	2	3	
Minimize Operating and Capital Costs	4	3	2	
Maximize Compatibility with Existing and Planned Development	4	4	3	
Minimize Impacts to Natural Resources	2	2	2	
Minimize Impacts to Social and Economic Resources	4	3	2	
Minimize Impacts to Cultural Resources	3	3	3	
Maximize Avoidance of Areas with Geologic and Soils Constraints	ND	ND	ND	
Maximize Avoidance of Areas with Potential Hazardous Materials	ND	ND	ND	

1 2 3 4 5

Least Favorable

Most Favorable

**ND = NOT A DISTINGUISHING FACTOR**

**Table S.2.5A**  
**Sacramento to Bakersfield – High-Speed Train Station Attainment of Objectives**  
**Fresno Stations**

Objective	Station S51 Fresno Downtown	Station S52 Fresno Chandler Field	Station S53 Fresno BNSF Amtrak	Station S54 Fresno Airport	Station S55 Fresno East	Station S56 Fresno West	
Maximize Ridership/Revenue Potential	4	4	4	3	2	3	
Maximize Connectivity and Accessibility	5	3	1	2	2	2	
Minimize Operating and Capital Costs	2	4	2	2	5	4	
Maximize Compatibility with Existing and Planned Development	3	2	2	1	2	2	
Minimize Impacts to Natural Resources	3	4	3	4	3	5	
Minimize Impacts to Social and Economic Resources	3	3	3	4	3	3	
Minimize Impacts to Cultural Resources	4	3	1	3	5	5	
Maximize Avoidance of Areas with Geologic and Soils Constraints	ND	ND	ND	ND	ND	ND	
Maximize Avoidance of Areas with Potential Hazardous Materials	ND	ND	ND	ND	ND	ND	

1 2 3 4 5

Least Favorable

Most Favorable

**ND = NOT A DISTINGUISHING FACTOR**

**Table S.2.5B**  
**Sacramento to Bakersfield – High-Speed Train Alignment Attainment of Objectives**  
**Fresno to Tulare Segment**

Objective	W99	BNSF	UP	E99
Maximize Connectivity and Accessibility	3	1	4	1
Maximize Ridership/Revenue Potential	4	2	3	1
Minimize Operating and Capital Costs	3	3	2	4
Maximize Compatibility with Existing and Planned Development	3	4	4	3
Minimize Impacts to Natural Resources	2	4	3	2
Minimize Impacts to Social and Economic Resources	3	2	2	3
Minimize Impacts to Cultural Resources	4	4	3	4
Maximize Avoidance of Areas with Geologic and Soils Constraints	ND	ND	ND	ND
Maximize Avoidance of Areas with Potential Hazardous Materials	ND	ND	ND	ND

1 2 3 4 5

Least Favorable

Most Favorable

**ND = NOT A DISTINGUISHING FACTOR**



**Table S.2.6A**  
**Sacramento to Bakersfield – High-Speed Train Station Attainment of Objectives**  
**Tulare Stations**

Objective	Station S61 Visalia Airport	Station S62 Hanford	Station S63 Tulare Airport	Station S64 Tulare East County	Station S65 Tulare West County		
Maximize Ridership/Revenue Potential	4	2	2	2	4		
Maximize Connectivity and Accessibility	4	2	2	2	3		
Minimize Operating and Capital Costs	4	3	4	4	4		
Maximize Compatibility with Existing and Planned Development	2	1	3	4	5		
Minimize Impacts to Natural Resources	3	5	3	1	2		
Minimize Impacts to Social and Economic Resources	5	5	5	5	3		
Minimize Impacts to Cultural Resources	5	5	4	3	5		
Maximize Avoidance of Areas with Geologic and Soils Constraints	ND	ND	ND	ND	ND		
Maximize Avoidance of Areas with Potential Hazardous Materials	ND	ND	ND	ND	ND		

1 2 3 4 5

Least Favorable

Most Favorable

**ND = NOT A DISTINGUISHING FACTOR**

**Table S.2.6B**  
**Sacramento to Bakersfield – High-Speed Train Alignment Attainment of Objectives**  
**Tulare to Bakersfield Segment**

Objective	W99	BNSF	UP	E99
Maximize Connectivity and Accessibility	3	2	4	1
Maximize Ridership/Revenue Potential	3	2	4	1
Minimize Operating and Capital Costs	4	2	2	3
Maximize Compatibility with Existing and Planned Development	3	2	4	3
Minimize Impacts to Natural Resources	2	3	3	2
Minimize Impacts to Social and Economic Resources	4	4	3	4
Minimize Impacts to Cultural Resources	3	3	2	3
Maximize Avoidance of Areas with Geologic and Soils Constraints	ND	ND	ND	ND
Maximize Avoidance of Areas with Potential Hazardous Materials	ND	ND	ND	ND

1 2 3 4 5

Least Favorable

Most Favorable

**ND = NOT A DISTINGUISHING FACTOR**

**Table S.2.7A**  
**Sacramento to Bakersfield – High-Speed Train Station Attainment of Objectives**  
**Bakersfield Stations**

<b>Objective</b>	<b>Station S71 Bakersfield Truxton</b>	<b>Station S72 Bakersfield Golden State</b>	<b>Station S73 Bakersfield Airport</b>	<b>Station S74 Bakersfield West</b>	<b>Station S75 Bakersfield East</b>	<b>Station S76 Bakersfield Old Amtrak</b>	<b>Station S77 Bakersfield South</b>
Maximize Ridership/Revenue Potential	4	4	3	2	2	3	2
Maximize Connectivity and Accessibility	4	3	2	2	2	3	2
Minimize Operating and Capital Costs	2	2	3	4	3	2	4
Maximize Compatibility with Existing and Planned Development	4	3	5	1	2	3	5
Minimize Impacts to Natural Resources	5	2	5	4	3	5	5
Minimize Impacts to Social and Economic Resources	3	5	4	3	3	4	5
Minimize Impacts to Cultural Resources	5	3	5	5	5	5	5
Maximize Avoidance of Areas with Geologic and Soils Constraints	ND	ND	ND	ND	ND	ND	ND
Maximize Avoidance of Areas with Potential Hazardous Materials	ND	ND	ND	ND	ND	ND	ND

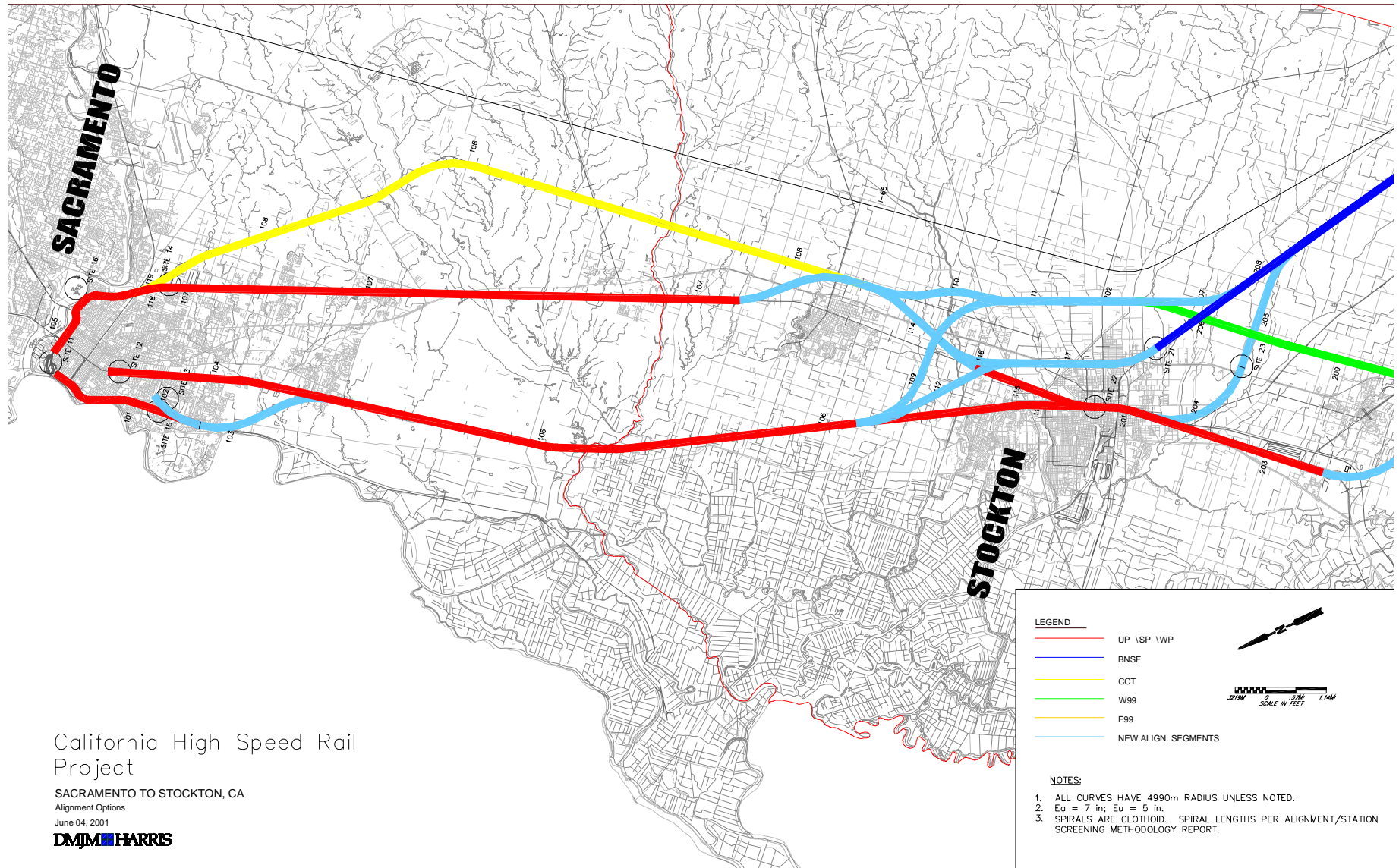
1 2 3 4 5

Least Favorable

Most Favorable

**ND = NOT A DISTINGUISHING FACTOR**

## SACRAMENTO TO STOCKTON

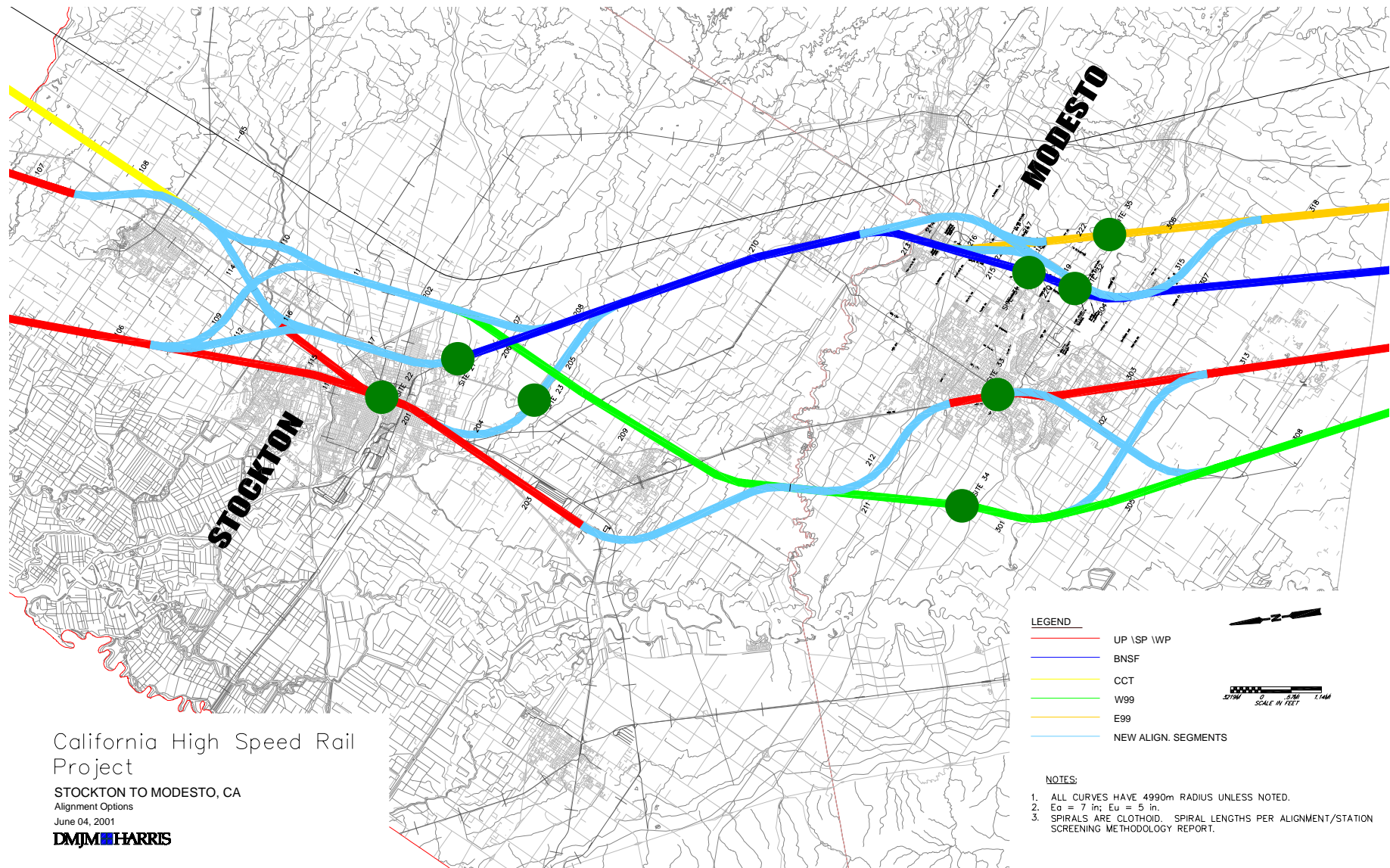
California High Speed Rail  
ProjectSACRAMENTO TO STOCKTON, CA  
Alignment Options

June 04, 2001

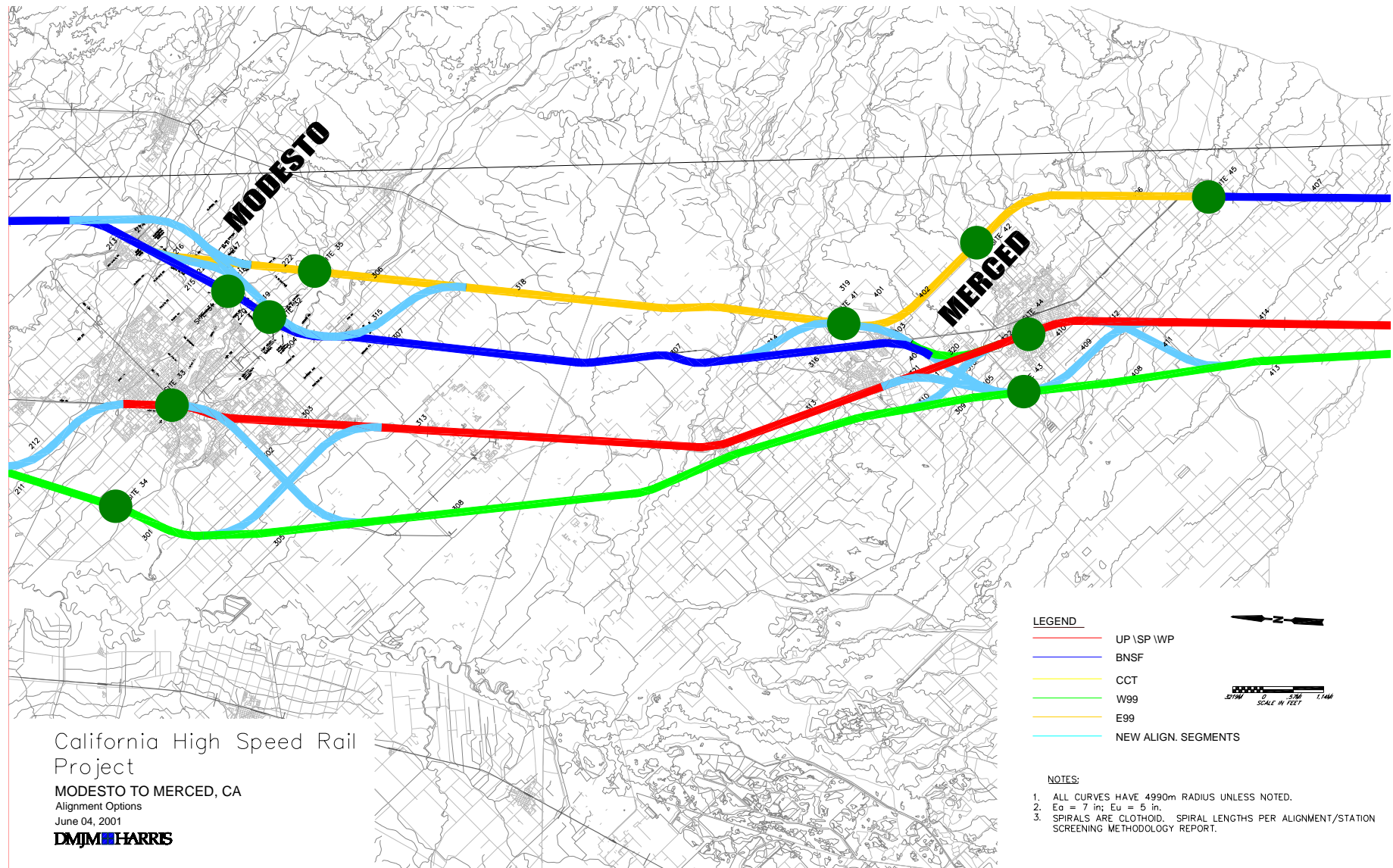
DMJM HARRIS



## STOCKTON TO MODESTO

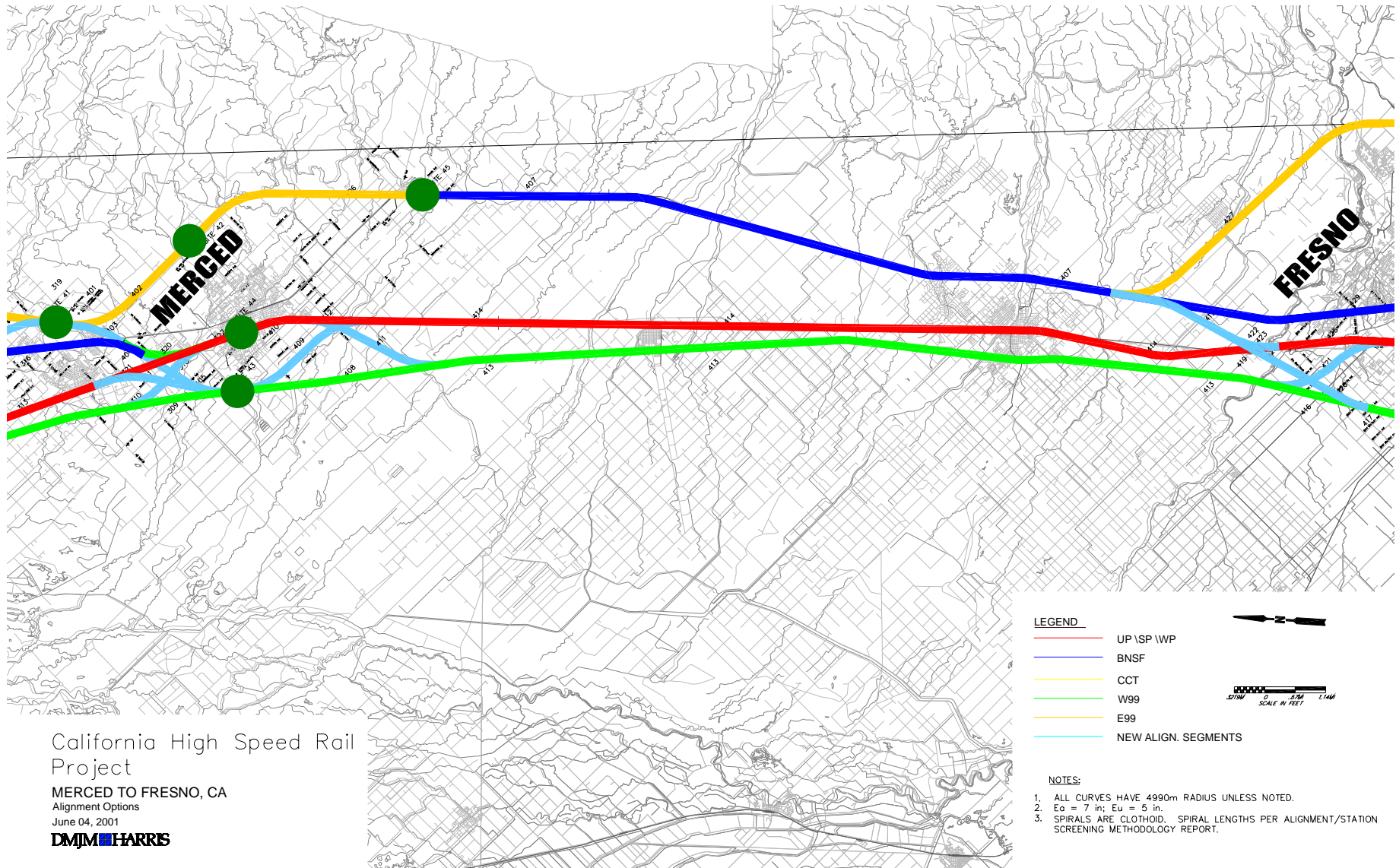


## MODESTO TO MERCED





## MERCED TO FRESNO



## FRESNO TO TULARE

California High Speed Rail  
Project

FRESNO TO TULARE, CA

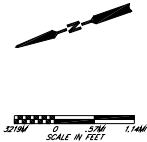
Alignment Options

June 04, 2001

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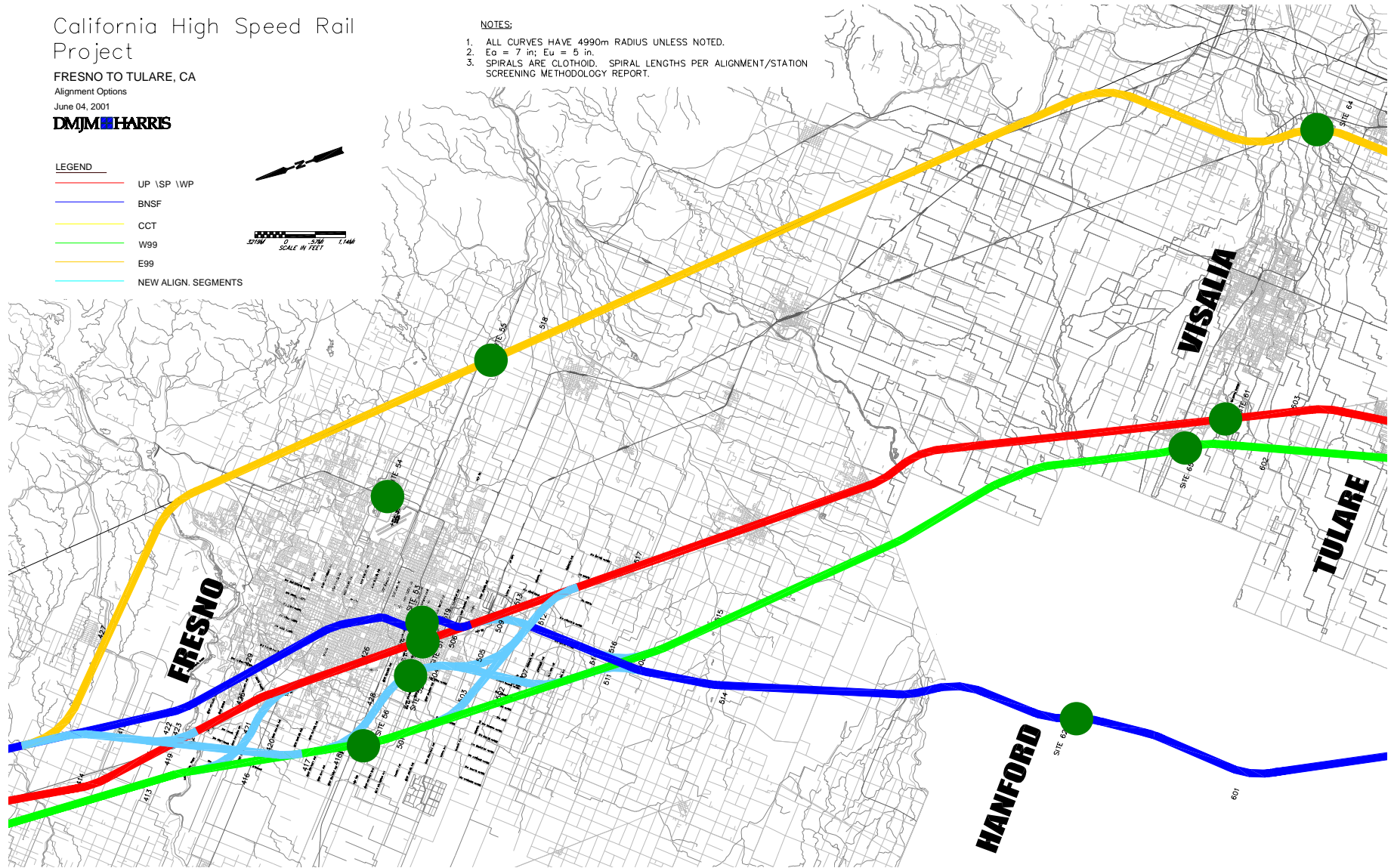
## LEGEND

- UP \SP \WP
- BNSF
- CCT
- W99
- E99
- NEW ALIGN. SEGMENTS



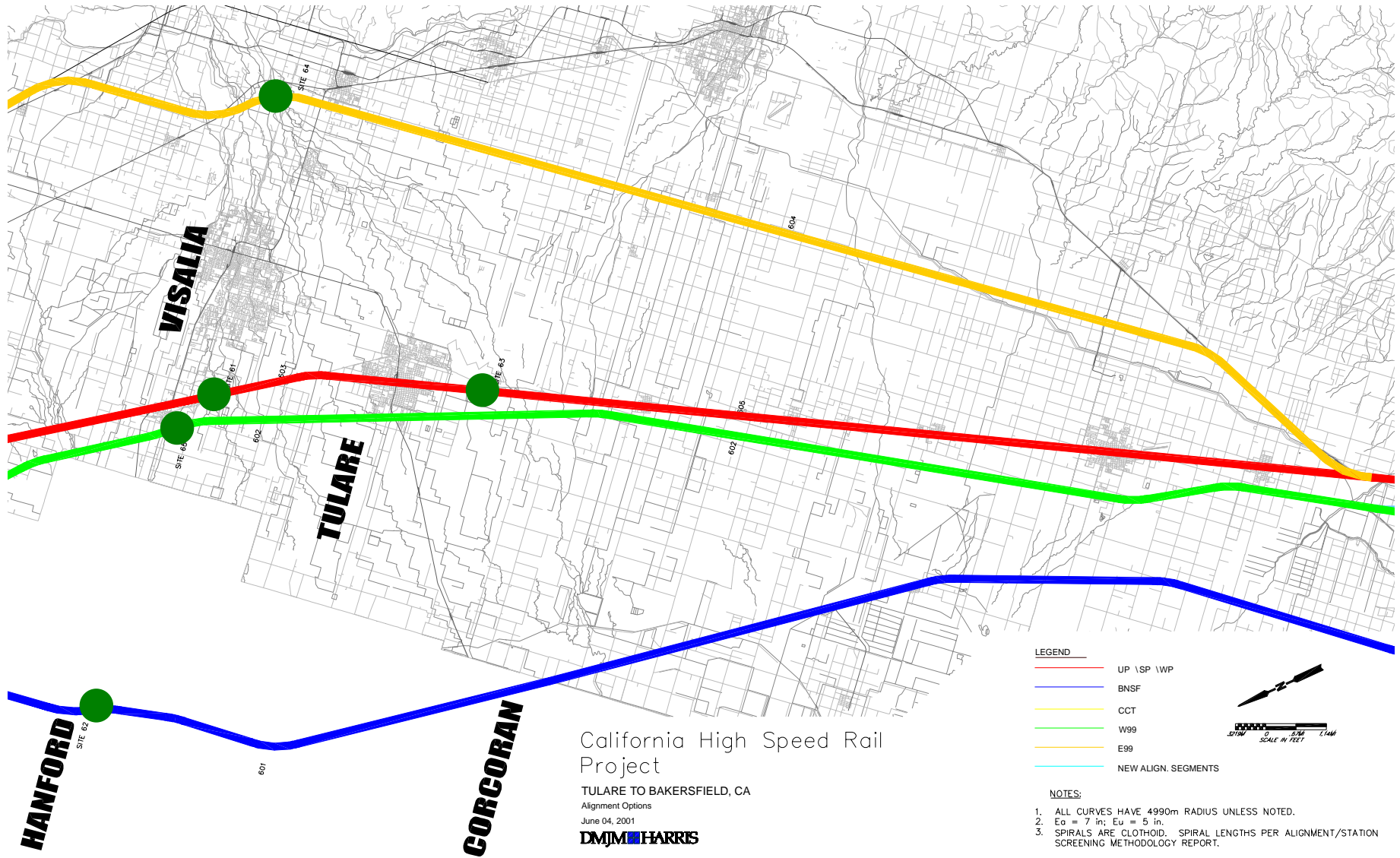
## NOTES:

1. ALL CURVES HAVE 4990m RADIUS UNLESS NOTED.
2. Eo = 7 in; Eu = 5 in.
3. SPIRALS ARE CLOTHOID. SPIRAL LENGTHS PER ALIGNMENT/STATION SCREENING METHODOLOGY REPORT.





## TULARE TO BAKERSFIELD



## BAKERSFIELD TO LA CONNECTIONS

